

## **PRIMARY SCHOOL TEACHERS' VARIABLES AS DETERMINANT OF LEARNERS' MATHEMATICS ACHIEVEMENT IN OYO STATE, NIGERIA**

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### **Abstract**

*The study investigated the extent to which primary school teachers' possesses teacher related variables (lesson preparation and delivery, subject matter mastery, pedagogy, classroom management, instructional materials use, evaluation of learning outcomes, information and communication technology use, gender, years of teaching experience and qualification), and how these variable affects learners' mathematics achievement in Oyo state, Nigeria. The ex-post facto research type was adopted in which a total of 93 teachers were simple randomly selected and pupils of primary 4 were purposively selected. Two valid and reliable research instruments were used to generate data for the study: the Basic Education Teachers' Needs-Assessment Instrument ( $r = 0.77$ ) and the Mathematics Achievement Test ( $r = 0.83$ ). Data were analysed using descriptive (mean and standard deviation) and inferential statistics (Multiple regression analysis) at 0.05 level of significance. Teacher in Oyo state primary schools, possesses the teaching variables in moderate extent (mean score = 10.94); also, teacher qualification ( $\beta = -.227$ ,  $t = -2.280$ ), teacher mastery of subject matter ( $\beta = .476$ ,  $t = 2.500$ ), teacher classroom management skill ( $\beta = -.344$ ,  $t = -2.533$ ), teacher use of instructional material ( $\beta = .276$ ,  $t = 1.860$ ), is statistically significant in determining learners' achievement in mathematics. It is recommended that mechanisms that will elicit and enhance teachers' related variables be put in place in order to boost learners' academic learning outcomes in mathematics.*

**Keywords:** Learners, Mathematics Achievement, Primary School, Teachers' Variables.

### **Introduction**

Primary education as defined by the National Policy on Education (2004) is the education meant for learners aged six to eleven years. It is the education learners receive before entering the secondary school in Nigeria. The Federal Government of Nigeria in 2004, outlined the goals of primary education; these goals include to: instil in learners, lasting skill for numeracy, literacy and communication; provide them with reflective and scientific thinking; inculcate in them citizenship education; instil best character, attitude and morals in pupils; enhance their adaptability in an evolving environment; foster the development of manipulative skills in learners that will turn them into functional and

effective citizens and equipping learners with the essential tools for future educational pursuits and endeavours. This level of education is fundamental to the existence and survival of both the secondary and tertiary education.

Primary school teachers and other stakeholders, are to ensure that these goals are achieved; developing and fostering the right skills and social abilities for the optimum improvement of learners in line with their ages, abilities and aptitude, while deepening their knowledge and understanding. Significant advances in the overall education quality that pupils' are exposed to, is dependent to a large extent on the teachers' quality. Teachers' impact on the academic achievement and long term success of learners cannot be overemphasized (Chetty, Friedman & Rockoff, 2014; Nye, Konstantopoulos & Hedges, 2004). More so, the responsibilities of the teachers at this level are: lesson planning in line with the curriculum; preparing the classroom for the teaching-learning processes; instructing learners, using several teaching approaches and resources and games at ensuring that the learners fully understand the content taught; regularly adapting to learners' changing needs; disciplining learners during and after classroom interactions; planning and piloting school sporting activities in and outside the school; regular assessment of learners; discern and evaluating learners' learning outcomes; amongst others.

Mathematics is a means through which pupils gain useful awareness and experiences required for their continued survival. It empowers learners with the knowledge with which to solve real life problems, improve their rational thinking abilities and perceptions, which they will eventually need and apply. The subject mathematics seems to discipline the mind, systemizes one's thought and reasoning; it is highly associated with one's daily living as compared to other subjects and provides order and pattern to life (Osiesi, 2016; Eraikhuemen, 2003). The knowledge of the subject in line with its concepts and techniques is crucial in the field of engineering, accounting, economics, banking and finance, commerce, and in the sciences. Teachers of mathematics, especially at the primary level of education should possess the needed computational and mathematical reasoning skills, intelligence and potentials in order to douse learners' phobia, dislike or failure in the subject. Mathematics teachers are to be vast and competent in subject content matter and teaching styles.

As echoed by Osiesi (2016), teachers who prepared their lessons and have planned how to deliver it unto learners' can effectively devote more time in guiding and facilitating learning. Unprepared teachers do find it difficult or impossible in organizing themselves or their learners'. Every teacher is expected to plan purposively for learners' learning in such a way that requires a cautious inquiry and selection of appropriate goals and content for learners (Eggan & Kauchak, 2001). Also, Niess (2006) reaffirmed that mathematics teachers should have a full grasps of detailed knowledge of subject content, pedagogy and technology as these tantamount in substantially predicting learners' mathematics learning and achievement (Hill, Ball & Schilling, 2008; Ball, Thames & Phelps, 2008; Luna & Aclan, 2015).

Teachers' gender in no small measure could affect learners' attitude towards learning and their general achievement. Chudgar and Sankar (2008) suggested that male and female teachers do differ in terms of their classroom management practices and their confidence in the learning ability of learners; that classrooms handled by female teachers are more beneficial for language learning but contended that teachers' gender has no effect on

learners' mathematics learning. Some researchers have shown that male teachers can have a positive influence on learners as they usually serve as role models (Mills, Haase, & Charlton, 2008; McGrath & Sinclair, 2013; Gibbs, 2012; Tucker, 2015; Cushman, 2008). Also, Genc and Ogan-Bekiroglu (2006) contended that the gender of the teacher has no significant correlation to his or her teaching strategies while Rubie-Davies, Flint and McDonald (2012) reaffirmed that female teachers do perform better than their male counterparts in the area of classroom management, teaching styles and engagement of learners.

Classroom management could be viewed as the actions a teacher executes in order to create an atmosphere that facilitates and supports teaching and learning processes. Likewise, Akpakwu (2004) defines it as putting learners, teaching aids and materials under control in order to achieve the envisaged learning objectives. Omenka and Otor (2015) exposed the effect of classroom management on learners' academic achievement in subjects such as mathematics and science related and found a positive significant correlation and Wilhelmina, Nicholas and Nicolette (2019) reported that teachers with better classroom management have learners' with higher motivations to and achievement in mathematics. Similarly, evaluation of learning helps to advance learners' learning outcomes by ensuring they learn by doing (Dahal 2019). Thus, teachers' effective evaluation of learning outcomes of learners' is among the most influential classroom strategy for contributing and improving students' learning achievement.

Instructional materials are indispensable tools by which subjects in the school curriculum are learned (Roseline, 2019). According to Idris (2008), actual teaching may be inevitable where practical, efficient instructional materials are absent for such subjects that is more or less science based. Also, a number of studies had proven that accessibility and availability of computers viz a viz information and communication technology do positively affect learners' achievement (Spiezja, 2010). However, Wittwer and Senkbeil (2008) revealed that use of computers do not have any effect on the mathematics performance of learners.

Strands of the literature established that teachers' variables such as years of experience, academic qualifications had no effect on the academic performance of pupils (Ayodele & Ige, 2012; Yara & Surumo, 2012) while others report in the contrary (Akinsolu, 2010; Adeyemi, 2008; Ewetan & Ewetan, 2015; Abu & Fabunmi, 2005) and Akpo (2012) reiterated that teachers' academic qualifications, standards-based professional development, teaching experience, subject specialization, classroom management beliefs are linked to learners' academic achievement in Mathematics; Further, Goldhaber and Brewer (2000) reported that teachers' subject matter preparedness do predict mathematics achievement of learners.

Poor academic performance of pupils may be linked to many factors which includes but not limited to political instability and politicization of educational programmes, years of teaching experience, poor quality of educational leadership, high teacher- ratio, automatic promotion, shortage of good teaching staff, age of the learners, decline in the quality of teaching and learning, inadequate essential physical facilities and equipment, academic qualifications, teacher development programmes, qualified teachers availability, student-teacher ratio, attitude of the teachers, job satisfaction, motivation and salary affect students" learning outcomes (Abu & Fabunmi, 2005; Ewetan, 2010; Adesoji & Olatunbosun, 2008; Akinwunmi & Odunsi, 2008; Daso, 2013, Akinsolu, 2010; Adeyemi, 2008; Chhinh &

Tabata, 2013; Akpo, 2012; Odiri, 2011; Bressoux, Kramarz & Prost, 2008). More so, studies abound that connects learners' poor achievement in Mathematics to teachers' related variables (Afrassa & Peeves, 1999; Akpo, 2012).

Pupils' achievement in mathematics is the aptitude shown by the pupil in mathematics. Most times, it is measured by scores obtained from a mathematics achievement test. Learning outcomes of pupils' in primary schools may be made or marred by the teacher related factors, such as classroom management, evaluation of learning outcomes, use of instructional materials, lesson preparation and delivery, mastery of subject matter, pedagogy, use of information and communication technology, gender, years of teaching experience and qualification; to mention but a few. The researchers are of the opinion that these aforementioned variables could to a large extent, determine learners' learning outcomes, especially in mathematics.

It is the expectation of education stakeholders in Nigeria; that learners, especially at the primary school, achieve greatly in their learning endeavours. Unfortunately, this is farther from the present reality, as learners' academic performance has continued to decline in major subjects like mathematics. Factors causing this decline in learners' achievement in mathematics may stem from teachers' related variables. Consequently, this study investigated primary school teachers' variables (lesson preparation and delivery, subject matter mastery, pedagogy, classroom management, instructional materials use, evaluation of learning outcomes, information and communication technology use, gender, years of teaching experience and qualification) as determinant of learners' mathematics achievement in Oyo state, Nigeria.

The researchers acknowledged that there exist knowledge in previous studies with regard to the impact of teachers' teaching variables on learners' performance in mathematics. More so, the previous studies did not consider all the teaching variables as discussed in this study. This study therefore, explored further the extent to which these teaching variables determine learners' achievement in mathematics; so as to provide more incite for the advancement of knowledge.

## **Research Questions**

1. To what extent do primary school teachers' exhibit the teaching variables in terms of: lesson preparation and delivery, mastery of subject matter, pedagogy, classroom management, use of instructional materials, evaluation of learning outcomes and use of information and communication technology in Oyo State, Nigeria?
2. To what extent would these teachers' variables (lesson preparation and delivery, mastery of subject matter, use of instructional materials, pedagogy, classroom management, evaluation of learning outcomes, use of information and communication technology, gender, years of teaching experience and qualification) together predict learners' achievement in mathematics?
3. What are the relative contributions of each of the variables to the prediction?

## **Significance of the Study**

The study proffered enlightenment on how teachers' variables (lesson preparation and delivery, mastery of subject matter, use of instructional materials, pedagogy, classroom

management, evaluation of learning outcomes, use of information and communication technology, gender, years of teaching experience and qualification) affects learners' achievement in mathematics. It also exposed the most predominant of these variables among primary school teachers in Oyo state, Nigeria. Teachers, governments, ministry of education and school owners are informed of what can predict learners' achievement (especially mathematics) as to ensure that these variables are boosted and continuously revived.

### **Methodology**

This study is an ex-post facto design; the variables used were not manipulated since they have already occurred. The populations for the study are all practicing primary school teachers and pupils in Oyo state, Nigeria. Practicing primary school teachers who had been randomly selected by UBEC/SUBEB 2019 teacher development and training programme from two local governments (Akinyele and Lagelu) constituted the study sample. They were ninety three participants in all, fifty teachers from Akinyele and forty three from Lagelu local government. Purposive sampling was adopted in selecting primary 4 pupils, who were directly under the tutelage of the teachers selected in the study as they majorly formed an organized intact class at the of data collection.

Two instruments used for this study are the Basic Education Teachers' Needs-Assessment Instrument (BETANASI); which was adopted and a Mathematics Achievement Test (MAT). The BETANASI was developed by UBEC/SUBEB for teachers' professional development and training programmes; and adapted by the researchers for the purpose of the study. The BETANASI comprised of sections A and B. Section A consist of teachers' bio data such as gender, years of teaching experience, academic qualification etc.; while section B consisted of seven sub-sections composed of: lesson preparation and delivery having eight items, subject matter mastery having eight items, pedagogy having eight items, classroom management having twelve items, instructional materials use with five items, evaluation of learning outcomes with five items, use of information and communication technology with six items.

The researchers assigned ten programme facilitators (who served as research assistants) to each of the local government training centers to help with data collection while the researchers went round to the designated local government areas to monitor and ensure the data is collected as it should. The researchers' pilot tested the instrument with forty five teachers and gave a Cronbach alpha reliability coefficient of 0.77 and was therefore considered reliable; as it was internally consistent. The MAT contained questions designed to test the cognitive level of achievement of learners'. It contained 20 multiple choice items with four options lettered A to D. Accurate answer to each of the items attracted a score of 5 while an incorrect answer attracted a score of 0. The MAT was pilot tested on 15 pupils in primary 4 who were not part of the sample for the study and the scores obtained was subjected to Kuder Richardson K-R 20 in obtaining the reliability coefficient. The K-R 20 gave a coefficient of 0.83, an indication that the MAT was reliable. These instruments were administered and the completed copies were retrieved for data analysis. Descriptive (mean and standard deviation) and inferential statistics (Multiple regression analysis) were used in analyzing the data for the study and answering the research questions therein with SPSS version 23.

### **Results**

## Research Questions 1

To what extent do primary school teachers' possess the necessary teaching skills in terms of: lesson preparation and delivery, mastery of subject matter, pedagogy, classroom management, use of instructional materials, evaluation of learning outcomes and use of information and communication technology in Oyo State, Nigeria?

**Table 1: Extent of Teachers Possession of Teaching Variables in Oyo State, Nigeria.**

/No	Descriptive Statistics		Mean	Std. Deviation
1.	Lesson preparation and delivery	3	1.25	3.10
2.	Mastery of subject matter	3	2.43	3.12
3.	Pedagogy	3	2.14	3.38
4.	Classroom management	3	8.65	4.92
5.	Use of instructional materials	3	7.28	1.86
6.	Evaluation of learning outcomes	3	7.38	2.21
7.	Use of information and communication technology	3	7.43	1.77
	<b>Aggregate Mean</b>		<b>10.94</b>	

**Note:** Aggregate mean score < 10.00 = Low extent, Mean score > 10.00  $\leq$  15.00 = Moderate extent, Mean score > 15.00 = High extent. The criterion Mean = 15.00

**Table 1** shows that the observed aggregate mean score of teachers in terms of the extent to which they possess the teaching variables (lesson preparation and delivery, mastery of subject matter, pedagogy, classroom management, use of instructional materials, evaluation of learning outcomes, use of information and communication technology) is 10.94 which is less than the criterion mean of 15.00; but falls within the moderate mean score. The implication of the results above is that teachers in Oyo state primary schools possess the teaching variables in moderate extent.

## Research Questions 2

To what extent does these teachers' skills (lesson preparation and delivery, mastery of subject matter, pedagogy, classroom management, use of instructional materials, evaluation of learning outcomes, use of information and communication technology, gender, years of teaching experience and qualification) together predict learners' achievement in mathematics?

**Table 2: Model Summary and ANOVA**

R = .498						
R Square = .248						
Adjusted R Square = .157						
Standard Error of Estimate = 20.24						

Model	Sum of Squares	Df	Mean Square	F	Sig.	
Regression	11113.56	10	1111.35	2.71	.006	
Residual	33611.22	82	409.893			
Total	44724.79	92				

$F_{(92)} = 2.711$ ,  $P < 0.05$ . The p-value on the ANOVA table is an indication that the composite effect of the predictor variables (lesson preparation and delivery, mastery of subject matter, pedagogy, classroom management, use of instructional materials, evaluation of learning outcomes, use of information and communication technology, gender, years of teaching experience and qualification) is statistically significant ( $p = .006$ ) in predicting the criterion variable (learners' achievement in mathematics). The multiple correlation ( $R = .498$ ) shows the relationship between the predictor and criterion variable; it means that the highest moderate and positive correlation between the predictor and criterion variables is 49.8%. The  $R^2 = .248$  is showing the degree of variation; that 24.8% variance in learners achievement in mathematics is accounted for by the combined effect of the predictor variables. This is very high; indicating that the criterion variable cannot be determined by the combination of the predictor variables.

The Adjusted R Square = .157 depicts that the model accounts for 15.7% of variance in learners' achievement in mathematics. This means that only 15.7% of the total variance in learners' achievement in mathematics is accounted for by lesson preparation and delivery, mastery of subject matter, pedagogy, classroom management, use of instructional materials, evaluation of learning outcomes, use of information and communication technology, gender, years of teaching experience and qualification; leaving the remaining 84.3% to chance and residual.

**Table 3: Extent to which Teachers' variable predict learners' achievement in Mathematics.**

Model	Unstandardized Coefficients	Standardized Coefficients	T	Sig.	Collinearity Statistics
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	B	Std. Error	Beta			Tolerance	VIF
(Constant)	82.764	14.052		5.890	000		
Teacher Qualification	-10.211	4.478	-.227	-2.280	<b>025</b>	.927	1.079
Teacher Gender	-6.489	4.596	-.142	-1.412	162	.912	1.097
Teachers Years of Teaching Experience	2.422	1.592	.147	1.522	132	.985	1.015
Teacher Lesson Preparation and Delivery	-.937	.681	-.182	-1.377	172	.522	1.917
Teacher Mastery of Subject Matter	2.030	.812	.476	2.500	<b>014</b>	.252	3.961
Teacher Pedagogy	-.703	.842	-.166	.835	406	.231	4.321
Teacher Classroom Management skill	-1.427	.563	-.344	-2.533	<b>013</b>	.496	2.014
Teacher Use of Instructional material	1.684	.905	.276	1.860	<b>041</b>	.416	2.404
Teachers Evaluation of Learning Outcome	-.989	.979	-.156	-1.010	315	.386	2.593
Teacher use of ICT	1.318	.849	-.204	-1.552	125	.529	1.890

**Significant at P <0.05.**

Table 3 shows that there is no multicollinearity among the predictor variables, since the Tolerance values is  $> 0.1$  and variance inflation factor (VIF) values  $< 10$ . Also, out of the ten predictor variables, teacher qualification ( $\beta = -.227$ ,  $t = -2.280$ ), teacher mastery of subject matter ( $\beta = .476$ ,  $t = 2.500$ ), teacher classroom management skill ( $\beta = -.344$ ,  $t = -2.533$ ), teacher use of instructional material ( $\beta = .276$ ,  $t = 1.860$ ), is statistically significant in predicting learners' achievement in mathematics. This asserts that teachers' qualification, mastery of subject matter, classroom management skill and use of instructional materials do significantly contributes to learners' achievement in mathematics. However, teacher Gender ( $\beta = -.142$ ,  $t = -1.412$ ), teachers years of teaching experience ( $\beta = .147$ ,  $t = 1.522$ ), teacher lesson preparation and delivery ( $\beta = -.182$ ,  $t = -1.377$ ), teacher pedagogy ( $\beta = -.166$ ,  $t = -.835$ ), teachers evaluation of learning outcome ( $\beta = -.156$ ,  $t = -1.010$ ) and teacher use of ICT ( $\beta = -.204$ ,  $t = -1.552$ ) did not significantly contribute to the prediction model. This implies that teachers' gender, years of teaching experience, lesson preparation and delivery, pedagogy, evaluation of learning outcome and use of ICT do not significantly contribute to learners' achievement in mathematics.

### **Research Question 3**

What are the relative contributions of each of the variables to the prediction?

As outlined on table 3, the relative contribution of each variable to learners' achievement in mathematics shows that only teacher qualification ( $\beta = -.227$ ,  $t = -2.280$ ), teacher mastery of subject matter ( $\beta = .476$ ,  $t = 2.500$ ), teacher classroom management skill ( $\beta = -.344$ ,  $t = -2.533$ ), teacher use of instructional material ( $\beta = .276$ ,  $t = 1.860$ ) had a significant contribution to the prediction. The other variables: teacher Gender ( $\beta = -.142$ ,  $t = -1.412$ ), teachers years of teaching experience ( $\beta = .147$ ,  $t = 1.522$ ), teacher lesson preparation and delivery ( $\beta = -.182$ ,  $t = -1.377$ ), teacher pedagogy ( $\beta = -.166$ ,  $t = -.835$ ), teachers evaluation of learning outcome ( $\beta = -.156$ ,  $t = -1.010$ ) and teacher use of ICT ( $\beta = -.204$ ,  $t = -1.552$ ) did not significantly contribute to the prediction model.

### **Discussion**

The result of the study has revealed that teachers in Oyo state primary schools possesses the teaching variables: lesson preparation and delivery, mastery of subject matter, pedagogy, classroom management, use of instructional materials, evaluation of learning outcomes, use of information and communication technology; in moderate extent. This result must have been as a result of irregular or non-attendance of the practicing teachers to professional development and training programmes. The findings negates the findings of the study by Osiesi and Fajobi (2019) who out that teachers primary school teachers in Oyo state had low teachers' quality as based on achievement of set objectives, use of teaching aids, time properly distributed, classroom management and teachers' evaluation of lesson taught.

The findings of the study also showed that teachers' qualification, mastery of subject matter, classroom management skill and use of instructional materials do significantly contributes to learners' achievement in mathematics. It is believed that the more qualified a teacher is, the better his/her lesson delivery and consequently, the higher and better the learners' achievement is. Teachers who have a great grasp of mastery of subject content, do deliver the contents of the subject effectively and efficiently, for a better learners' achievement in the subject. Pupils' learn and achieve better where and when the environment for learning (the classroom) is congenial and well managed by the teacher. Further, teachers' and learners' use of instructional materials ensures that learning is inclusive enough as all in such a classroom is on same page; it also facilitates learners' assessment of what has been taught in order to foster their achievement in such a learning endeavor. This finding agrees with those of Wilhelmina, Nicholas and Nicolette (2019) and Bassey, Ndiyo and Joshua (2010) which reported in their study that teachers' classroom management has a direct significant effect on learners' motivation and an indirect significant effect on their achievement in mathematics. Further, the finding of the study did reveal that teachers' gender, years of teaching experience, lesson preparation and delivery, pedagogy, evaluation of learning outcome and use of ICT do not significantly contribute to learners' achievement in mathematics.

### **Conclusion**

The study findings have great implications for stakeholders in the education sector, especially for the government, ministries of education, school owners, curriculum planners and teacher training colleges. As exposed by the study, teacher qualification, mastery of subject matter, classroom management skill and use of instructional materials do

significantly contributes to learners' achievement in mathematics. However, the study revealed that teachers used in this study possessed these variables in moderate extent.

### **Recommendation**

It is thus recommended that stakeholders, should ensure that mechanisms that will elicit and enhance these teachers' related variables (qualification, mastery of subject matter, classroom management skill and use of instructional materials); be put in place as well as improved upon, in order to boost learners academic learning outcomes in mathematics.

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